NON-PUBLIC?: N
ACCESSION #: 9011060419
LICENSEE EVENT REPORT (LER)

FACILITY NAME: R.E. Ginna Nuclear Power Plant PAGE: 1 OF 11

DOCKET NUMBER: 05000244

TITLE: Turbine Trip Relay Actuation Due to Dropped Flashlight in Relay Rack (Personnel Error), Causes a Reactor Trip
EVENT DATE: 09/26/90 LER #: 90-012-00 REPORT DATE: 10/26/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 097

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On September 26, 1990, at 1100 EDST with the reactor at approximately 97% full power, a reactor trip occurred from an opening of the "A" Reactor Trip Breaker, followed in approximately seven (7) seconds by a low pressurizer pressure reactor trip signal and the opening of the "B" Reactor Trip Breaker.

The "A" Reactor Trip Breaker opening was caused by the inadvertent dropping of a flashlight on two of three turbine autostop trip relays. The low pressurizer pressure reactor trip was caused by the reactor coolant system cooldown due to the reactor being tripped with the turbine still on the line.

Immediate corrective action was to stabilize the plant in hot shutdown.

Corrective action to prevent recurrence will be based upon the recommendations of a Human Performance Enhancement System (HPES) evaluation of the dropped flashlight event. Corrective action for subsequent hardware malfunctions will also be taken.

END OF ABSTRACT

I. PRE-EVENT PLANT CONDITIONS

The reactor was at approximately 97% steady state full power with no major activities in progress. Electrical Control Configuration Drawing (ECCD) personnel were performing electrical wire verifications in the RA1 Relay Protection Rack.

II. DESCRIPTION OF EVENT

A. Dates and approximate times of major occurrences:

o September 26, 1990, 1100 EDST: Event date and time.

o September 26, 1990, 1100 EDST: Discovery date and time.

o September 26, 1990, 1100 EDST: Control Room operators verify both reactor trip breakers open and all control and shutdown rods inserted.

o September 26, 1990, 1105 EDST: Control Room operators closed both Main Steam Isolation Valves (MSIVs) to terminate plant cooldown.

o September 26, 1990, 1115 EDST: Plant stabilized at hot shutdown.

B. EVENT:

On September 26, 1990, at 1100 EDST, with the reactor at approximately 97% full power, the Control Room received several annunciator alarms. Most notable of these alarms was the red first out annunciator alarm, K-2 (Rx Trip Breakers Open).

The Control Room operators immediately checked the reactor trip breaker position indicators and observed that the "A" Reactor

Trip Breaker was open and the "B" Reactor Trip Breaker was still closed. The Reactor Trip Annunciator Panel was also checked at this time for the cause of the trip. There were no annunciators lit.

The Control Room operators immediately began verifying the immediate actions of procedure E-O (Reactor Trip or Safety Injection) from memory as follows:

o At least one train of reactor trip breakers open - The "A" Reactor Trip Breaker was open.

o Neutron Flux decreasing

o MRPI indicates all control and shutdown rods on the bottom

At this time (i.e. approximately seven (7) seconds into the event), the Reactor Protection system received a reactor trip signal from low pressurizer pressure. The "B" Reactor Trip Breaker opened and the turbine was verified to be tripped.

It should be noted here that for the approximately seven (7) seconds between the "A" Reactor Trip Breaker opening until the low pressurizer pressure reactor trip, the turbine was still online at approximately 80% power. This was due to the Turbine Emergency Trip (ET) solenoid valve not functioning properly when the ET relay received a trip signal from the "A" Reactor Trip Breaker "open" contact. The low pressurizer pressure reactor trip and the opening of the "B" Reactor Trip Breaker subsequently tripped the turbine.

With the turbine operating at approximately 80% power and the reactor shutdown (i.e. all shutdown and control rods inserted), a Reactor Coolant system (RCS) cooldown occurred, due to the heat removal imbalance. The level of both steam generators decreased below 16% narrow range level indication for a short period of time. Level recovery was achieved through the operation of the turbine-driven and motor-driven auxiliary feedwater pumps. The RCS cooldown from the seven (7) second heat imbalance caused RCS temperature to decrease to approximately 535 degrees F, which is about 10 degrees F less than the temperature at stable hot shutdown conditions. The operators, believing a cooldown was still in progress five (5) minutes after the reactor shutdown, followed optional procedural guidance, and closed both Steam Generator MSIVS. The closed MSIVs, coupled with the turbine trip, mitigated any remaining mechanisms for RCS cooldown, and the plant was stabilized in hot shutdown. This cooldown was also partially due to cooler water being fed to the steam generators by the Auxiliary Feedwater System.

Other equipment problems that occurred during the event were:

o The "A" Steam Generator MSIV failed to fully close after receipt of an actuation signal. The valve external indicator revealed approximately one-quarter of an inch lack of travel from being fully closed. The valve subsequently closed approximately five minutes after signal receipt.

o The Intermediate Range Nuclear Instrumentation, Channel N-35, after tracking identical to Channel N-36, down to approximately 10**-10 amps, had its indication rapidly drop below 10**-11 amps. The N-35 channel returned to normal approximately ten hours following the trip.

The Control Room operators notified higher supervision and the Nuclear Regulatory Commission (NRC) of the event.

C. INOPERABLE STRUCTURES, COMPONENTS, OR SYSTEMS THAT CONTRIBUTED
TO THE EVENT:

None

D. OTHER SYSTEMS OR SECONDARY FUNCTIONS AFFECTED:

None

E. METHOD OF DISCOVERY:

The event was immediately apparent due to alarms and indications in the Control Room.

F. OPERATOR ACTION:

After the reactor trip, the Control Room operators performed the actions of Emergency Operating Procedures E-O, (Reactor

Trip or Safety Injection) and ES-O.1, (Reactor Trip Response) and stabilized the plant. The MSIVs were closed approximately five (5) minutes after the trip to prevent further plant cooldown.

G. SAFETY SYSTEM RESPONSE:

None

III. CAUSE OF EVENT

A. IMMEDIATE CAUSE:

The reactor trip occurred due to the "A" Reactor Trip Breaker opening.

B. INTERMEDIATE CAUSE:

The "A" Reactor Trip Breaker opening was due to the bumping of two turbine autostop trip (AST) relays in the RA1 Relay Rack. This bumping occurred from a small flashlight (powered by "AA" batteries) that was

being used by an ECCD person. While performing electrical wire verifications, the flashlight was accidently dropped and fell onto the relays. A normal actuation of the two relays would result in actuation of both trains of logic (i.e. opening of both reactor trip breakers and subsequent turbine trip) as each relay has an "A" and "B" train contact. The postulated cause for actuation of only one train of logic, ("A" Train Reactor Trip Breaker) is that the bumping effect was such that localized chatter of only the "A" train contacts occurred. The logic for reactor trip is the actuation of at least two out of the three AST relays. Later testing confirmed that, if normally actuated, the "B" train trip signal AST circuit would operate properly.

C. ROOT CAUSE:

The accidental dropping of the flashlight that bumped the relays was a personnel error.

IV. ANALYSIS OF EVENT

This event is reportable in accordance with 10 CFR 50.73, Licensee Event Report System, item (a)(2)(iv), which requires reporting of "any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS)," in that the "A" Reactor Trip Breaker opening and subsequent Low Pressurizer Pressure Reactor Trip was an automatic actuation of the RPS.

An assessment was performed considering both the safety consequences and implications of this event with the following results and conclusions:

o When initiated by an input signal, the two reactor trip breakers opened as required.

o All control and shutdown rods inserted to shut the reactor down as designed.

o The plant was quickly stabilized in hot shutdown.

This transient was compared to increase in decay heat removal transients in the Ginna Updated Final Safety Analysis (UFSAR). None of the assumptions of the UFSAR were violated during the event. The resultant cooldown from the reactor trip and the turbine remaining on line caused pressurizer pressure to decrease rapidly. The rate sensitive low pressurizer pressure trip caused a reactor trip, opening the "B" Reactor Trip Breaker. The opening of the "B" Reactor Trip Breaker caused the turbine to trip.

The following factors led to the cooldown, as compared with the cooldown expected following a normal reactor trip:

o Failure of the 20 ET solenoid to trip the turbine when the "A" Reactor Trip Breaker opened. Reactor trip without turbine trip caused the RCS to cooldown to approximately 535 degrees F.

o Lo Lo level on both steam generators caused the turbine driven auxiliary feedwater pump to start. Steam extracted from the header by the turbine driven auxiliary feedwater pump contributed to the cooldown.

o Total auxiliary feedwater flow of greater than 470 gallons per minute per steam generator also contributed to the cooldown.

Due to the above circumstances, the cooldown of the RCS to approximately 535 degrees F is not unexpected. This cooldown is bounded by plant accident analysis and does not exceed the technical specification limit of 100 degrees F per hour. Additional protection is provided by closure of the MSIVs.

Based on the above, it can be concluded that the public health and safety was assured at all times.

V. CORRECTIVE ACTION

A. ACTION TAKEN TO RETURN AFFECTED SYSTEMS TO PRE-EVENT NORMAL
STATUS:

o Relay logic testing was performed on the turbine trip functions per maintenance Procedure M-51.11 (Turbine Trip and Auxiliary Governor) and emergency maintenance procedure EM-748 (Check Out of the Turbine Auto stop Oil Circuitry Including the Verification of the 63X-3, 63X-4, 63X-5 MG-6 Relays and Associated Alarms). Potential failure modes for the 20 ET subsystem were identified and evaluated. Work packages were assembled to identify the root cause. Results of these investigations verified the electrical integrity, and verified that all relays, alarms and the 20 ET trip solenoid operated properly. A representative from the solenoid valve vendor, Parker-Hannefin, was present to support analysis of the failed solenoid valve, and to support preparation of the work package to replace the valve. The 20 ET trip solenoid was replaced with a qualified spare and tested satisfactorily. Fluid chemical and Particulate analysis was performed and results were evaluated. Metallurgical analysis of the failed solenoid valve will be performed. All filters in the supply and return lines were removed and physically inspected for particulates and new filters were installed. A failure mode affecting the hydraulic pilot valve is the most likely cause, and further investigations for the true failure mode will be performed.

o The "A" MSIV, manufactured by Atwood and Morrill, is a 30 inch air operated swing check valve, installed in the reverse direction to use Steam Generator steam flow to ensure proper closure. Complete closure, as with any swing check valve, is accomplished by the force of the fluid flow on the valve disc. The closing moment must be large enough to overcome the friction on the

valve shaft due to the valve packing. Both MSIV'S were stroked several times to ensure operability and adequate closure capability. Results of these tests support the conclusion that failure of the "A" MSIV to fully seat during the plant trip was not due to internal valve distortion and bending, but was the result of a lack of flow across the valve disc. Failure to close is attributed to the closure operation occurring in a quiescent environment. Valve closure was dependent solely upon two factors: the moment developed by the weight of the valve disc, and the spring provided to assist in valve closure. Without the additional assistance of steam flow across the valve disc, the valve was not capable of completing its closing operation. Based upon valve seat area, a one (1) psi differential across the valve seat would develop a moment of approximately 450 ft-lbs. This moment is comparable to the moment developed by the weight of the valve disc in its closed position. For all design basis accidents where MSIV closure is required, the accident transient would develop a large enough differential pressure to obtain complete valve closure. We are evaluating various packing materials which have a low friction coefficient and can perform the sealing function.

o As the Intermediate Range NIS Channel N-35 tracked NIS Channel N-36 for its normal operating range and returned to normal approximately ten (10) hours after the trip, no immediate action was deemed necessary. Specific logarithmic amplifier idle current adjustments internal to the PC card are being considered to correct NIS Channel N-35 response below 10**-10 amps. Westinghouse personnel were contacted, and they confirmed potential impact of the amplifier idle current on channel output, and that this output does not affect the safety function of the Intermediate

Range NIS Channel. A further evaluation of the response characteristics of NIS Channel N-35 will be performed.

B. ACTION TAKEN OR PLANNED TO PREVENT RECURRENCE:

As the root cause of the opening of the "A" Reactor Trip Breaker was considered to be personnel error, the following actions are being planned:

o Perform a Human Performance Enhancement System (HPES) evaluation of the dropped flashlight event.

o Evaluate the dropped flashlight event and the recommendations of the HPES evaluation prior to resuming field walkdowns for the ECCD project.

o In addition to their actions, corrective action for the subsequent hardware malfunctions will also be taken. Details are provided in paragraph V. A. above.

VI. ADDITIONAL INFORMATION

A. FAILED COMPONENTS:

None.

B. PREVIOUS LERs ON SIMILAR EVENTS:

A similar LER event historical search was conducted with the following results: LER 87-004 (Inadvertent Containment Isolation Due to Personnel Error During Electrical Wire Checkout of Safety Injection Relay Cabinet) was a similar event with the same root cause. The corrective action taken for the 1987 event was not directly applicable to this event, since the ECCD walkdown on September 26, 1990 was not intended to touch or disturb any wiring, but to only perform visual verifications. Corrective actions instituted in 1987 were intended for those situations when actual work was to occur inside a cabinet.

C. SPECIAL COMMENTS:

An NRC Augmented Inspection Team (AIT) was dispatched to Ginna to review the reactor trip. This review took approximately two

days and t
e plant remained shutdown until the AIT review was completed.

The LER search also identified an LER with similar consequences: LER 85-007 (Automatic Actuation of the Reactor Protection System) was an event where the turbine failed to trip, after actuation of the 20 ET trip solenoid. This was determined to be due to mechanical binding of the solenoid plunger. Corrective action was to replace the solenoid, and perform annual testing to verify operability.

ATTACHMENT 1 TO 9011060419 PAGE 1 OF 1

RGANDE

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October 26, 1990

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Subject: LER 90-012, Turbine Trip Relay Actuation Due to Dropped Flashlight in Relay Rack (Personnel Error),
Causes a Reactor Trip
R.E. Ginna Nuclear Power Plant
Docket No. 50-244

In accordance with 10 CFR 50.73, Licensee Event Report System, item (a)(2)(iv), which requires a report of, "any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF) including the Reactor Protection System (RPS)", the attached Licensee Event Report LER 90-012 is hereby submitted.

This event has in no way affected the public's health and safety.

Very truly yours,

Robert C. Mecredy

xc: U.S. Nuclear Regulatory Commission
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Ginna USNRC Senior Resident Inspector

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